Title: **Method and System For Inspecting Electronic Components Mounted on Printed Circuit Boards**
First Named Inventor: **John J. Weisgerber, et al.**
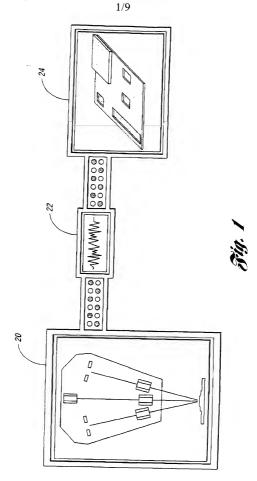Application Serial No.: / Atty. Docket No.: **GSIL 0148 PUS**

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Fig. 1

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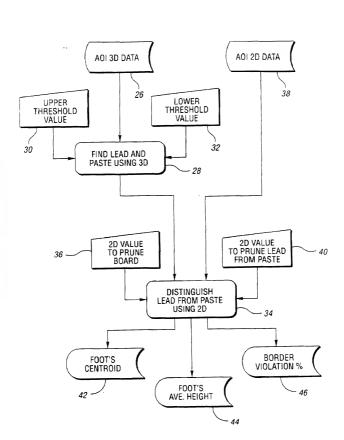Application Serial No.:   /   Atty. Docket No.: GSIL 0148 PUS
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AOI 3D DATA

AOI 2D DATA

26

38

UPPER
THRESHOLD
VALUE

LOWER
THRESHOLD
VALUE

30

32

FIND LEAD AND
PASTE USING 3D

28

2D VALUE
TO PRUNE
BOARD

36

2D VALUE
TO PRUNE LEAD
FROM PASTE

40

DISTINGUISH
LEAD FROM PASTE
USING 2D

34

FOOT'S
CENTROID

BORDER
VIOLATION %

42

46

FOOT'S
AVE. HEIGHT

44

Fig. 2

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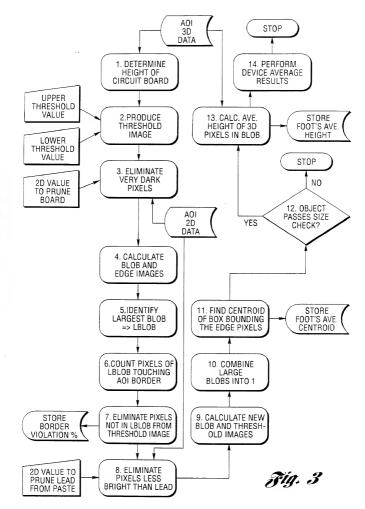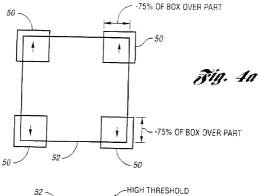Application Serial No.:   /   Atty. Docket No.: **GSIL 0148 PUS**

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AOI 3D DATA

STOP
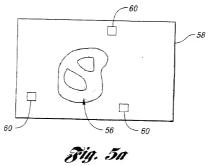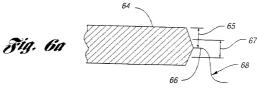
1. DETERMINE HEIGHT OF CIRCUIT BOARD

14. PERFORM DEVICE AVERAGE RESULTS

UPPER THRESHOLD VALUE

2. PRODUCE THRESHOLD IMAGE

13. CALC. AVE. HEIGHT OF 3D PIXELS IN BLOB

STORE FOOT'S AVE. HEIGHT

LOWER THRESHOLD VALUE

STOP

3. ELIMINATE VERY DARK PIXELS

NO

2D VALUE TO PRUNE BOARD

12. OBJECT PASSES SIZE CHECK?

AOI 2D DATA

YES

4. CALCULATE BLOB AND EDGE IMAGES

5. IDENTIFY LARGEST BLOB => LBLOB

11. FIND CENTROID OF BOX BOUNDING THE EDGE PIXELS

STORE FOOT'S AVE. CENTROID

6. COUNT PIXELS OF LBLOB TOUCHING AOI BORDER

10. COMBINE LARGE BLOBS INTO 1

STORE BORDER VIOLATION %

7. ELIMINATE PIXELS NOT IN LBLOB FROM THRESHOLD IMAGE

9. CALCULATE NEW BLOB AND THRESH-OLD IMAGES

2D VALUE TO PRUNE LEAD FROM PASTE

8. ELIMINATE PIXELS LESS BRIGHT THAN LEAD

Fig. 3

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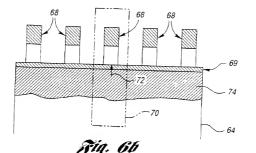Application Serial No.:   /   Atty. Docket No.: **GSIL 0148 PUS**

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-75% OF BOX OVER PART

50

50

-75% OF BOX OVER PART

50

52

50

Fig. 4a

52

HIGH THRESHOLD

THESE DISTANCES
ARE PARAMETERS

LOW THRESHOLD

Fig. 4b
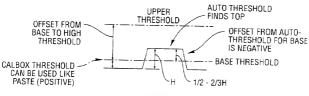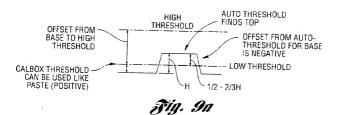
60

58

60

56

60

Fig. 5a

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Fig. 5b

Fig. 6a

Fig. 6b

UPPER THRESHOLD
(IN Z DEPTH)

LOWER THRESHOLD

Fig. 7a

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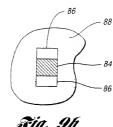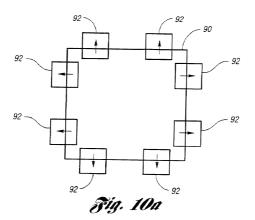Application Serial No.: / Atty. Docket No.: **GSIL 0148 PUS**

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82   82

76

Fig. 7b

79 80 78

81

77

76

Fig. 7c

OFFSET FROM
BASE TO HIGH
THRESHOLD

UPPER
THRESHOLD

AUTO THRESHOLD
FINDS TOP

OFFSET FROM AUTO-
THRESHOLD FOR BASE
IS NEGATIVE

BASE THRESHOLD

CALBOX THRESHOLD
CAN BE USED LIKE
PASTE (POSITIVE)

H   1/2 - 2/3H

Fig. 8

OFFSET FROM
BASE TO HIGH
THRESHOLD

HIGH
THRESHOLD

AUTO THRESHOLD
FINDS TOP

OFFSET FROM AUTO-
THRESHOLD FOR BASE
IS NEGATIVE

LOW THRESHOLD

CALBOX THRESHOLD
CAN BE USED LIKE
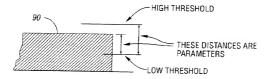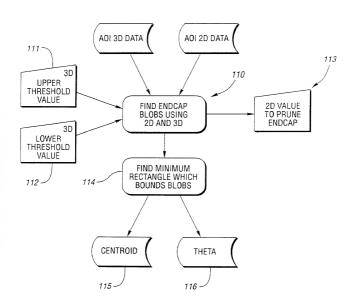PASTE (POSITIVE)

H   1/2 - 2/3H

Fig. 9a

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Fig. 9b

Fig. 10a

HIGH THRESHOLD

THESE DISTANCES ARE
PARAMETERS

LOW THRESHOLD

Fig. 10b

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111

AOI 3D DATA

AOI 2D DATA

113

3D
UPPER
THRESHOLD
VALUE

110

3D
LOWER
THRESHOLD
VALUE

FIND ENDCAP
BLOBS USING
2D AND 3D

2D VALUE
TO PRUNE
ENDCAP

112

114

FIND MINIMUM
RECTANGLE WHICH
BOUNDS BLOBS

CENTROID

THETA

115

116

Fig. 11

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Fig. 12